

WHAT IS CLAIMED IS:

1. A method of fabricating an optoelectronic device, comprising:

depositing a first layer over a first electrode by organic vapor phase deposition, wherein the first layer comprises a first organic small molecule material;

depositing a second layer on the first layer such that the second layer is in physical contact with the first layer, wherein the interface of the second layer on the first layer forms a bulk heterojunction; and

depositing a second electrode over the second layer to form the optoelectronic device.
2. The method of claim 1, wherein the first layer is an electron donor layer, the first electrode is an anode, the second layer is an electron acceptor layer, and the second electrode is a cathode.
3. The method of claim 1, wherein the first layer is an electron acceptor layer, the first electrode is a cathode, the second layer is an electron donor layer, and the second electrode is an anode.
4. The method of claim 1, wherein the first layer has a surface area-to-volume ratio of at least 2:1.
5. The method of claim 4, wherein the first layer has a surface area-to-volume ratio of at least 5:1.

6. The method of claim 1, wherein the second layer comprises a second organic small molecule material and is deposited by organic vapor phase deposition, wherein the organic vapor phase deposition of the first and second layers occurs at an underlying substrate temperature in the range of about 0° to about 100°C, and at a deposition chamber pressure in the range of about 50 mTorr to about 10 Torr.
7. The method of claim 6, wherein the first electrode comprises ITO, the first layer comprises CuPc, and the second layer comprises PTCBI.
8. The method of claim 6, wherein the first electrode comprises ITO, the first layer comprises CuPc, and the second layer comprises C₆₀.
9. The method of claim 1, wherein the cohesive energy of the first organic small molecule material is such that the first organic small molecule material tends to adhere to itself rather than an underlying substrate.
10. The method of claim 1, further comprising:

depositing the first layer over a substrate.
11. The method of claim 10, wherein the substrate comprises plastic.

12. The method of claim 2, further comprising:

depositing an exciton blocking layer over the second layer, such that the second electrode is deposited over the exciton blocking layer.

13. The method of claim 12, wherein the exciton blocking layer is deposited by organic vapor phase deposition, and comprises BCP.

14. The method of claim 1, further comprising:

depositing a wetting layer over the first electrode, such that the first layer is deposited over the wetting layer; and

depositing a planarizing layer over the second layer, such that the second electrode is deposited over the planarizing layer.

15. The method of claim 14, wherein the wetting layer and the planarizing layer are deposited by organic vapor phase deposition.

16. The method of claim 15, wherein the planarizing layer comprises PEDOT:PSS, and the wetting layer comprises PEDOT:PSS.

17. A method of fabricating an optoelectronic device, comprising:

depositing a first layer having protrusions over a first electrode, wherein the first

layer comprises a first organic small molecule material;

depositing a second layer on the first layer such that the second layer is in physical contact with the first layer, wherein the interface of the second layer on the first layer forms a bulk heterojunction; and

depositing a second electrode over the second layer to form the optoelectronic device.

18. The method of claim 17, wherein the first layer is an electron donor layer, the first electrode is an anode, the second layer is an electron acceptor layer, and the second electrode is a cathode.
19. The method of claim 17, wherein the first layer is an electron acceptor layer, the first electrode is a cathode, the second layer is an electron donor layer, and the second electrode is an anode.
20. The method of claim 17, wherein the diameter of the protrusions are between 1 to 5 times the exciton diffusion length of the first organic small molecule material.
21. The method of claim 20, wherein the diameter of the protrusions are between 1.5 to 3 times the exciton diffusion length of the first organic small molecule material.
22. The method of claim 18, wherein the first electrode comprises ITO, the first layer comprises CuPc, and the second layer comprises PTCBI.

23. The method of claim 18, wherein the first electrode comprises ITO, the first layer comprises CuPc, and the second layer comprises C₆₀.
24. The method of claim 17, wherein the cohesive energy of the first organic small molecule material is such that the first organic small molecule material tends to adhere to itself rather than an underlying substrate.
25. The method of claim 17, further comprising:

depositing the first layer over a substrate.
26. The method of claim 25, wherein the substrate comprises plastic.
27. The method of claim 18, further comprising:

depositing an exciton blocking layer over the second layer, such that the second electrode is deposited over the exciton blocking layer.
28. The method of claim 27, wherein the exciton blocking layer comprises BCP.
29. The method of claim 17, further comprising:

depositing a wetting layer over the first electrode, such that the first layer is deposited over the wetting layer; and

depositing a planarizing layer over the second layer, such that the second electrode is deposited over the planarizing layer.

30. The method of claim 29, wherein the planarizing layer comprises PEDOT:PSS, and the wetting layer comprises PEDOT:PSS.

31. The method of claim 1, further comprising:

depositing an electron-hole recombination zone over the second layer;

depositing a third layer over the electron-hole recombination zone by organic vapor phase deposition, wherein the third layer comprises a third organic small molecule material;

depositing a fourth layer on the third layer such that the fourth layer is in physical contact with the third layer, wherein the interface of the fourth layer on the third layer forms a bulk heterojunction; and

depositing the second electrode over the fourth layer to form the optoelectronic device.

32. The method of claim 17, further comprising:

depositing an electron-hole recombination zone over the second layer;

depositing a third layer having protrusions over the electron-hole recombination zone, wherein the third layer comprises a third organic small molecule material;

depositing a fourth layer on the third layer such that the fourth layer is in physical

contact with the third layer, wherein the interface of the fourth layer on the third layer forms a bulk heterojunction; and

depositing the second electrode over the fourth layer to form the optoelectronic device.

33. A method of forming a bulk heterojunction comprising:

depositing a first layer over a substrate by organic vapor phase deposition, wherein the first layer comprises a first organic small molecule material; and

depositing a second layer on the first layer such that the second layer is in physical contact with the first layer, wherein the interface of the second layer on the first layer forms a bulk heterojunction.

34. A method of forming a bulk heterojunction comprising:

depositing a first layer having protrusions over a substrate, wherein the first layer comprises a first organic small molecule material; and

depositing a second layer on the first layer such that the second layer is in physical contact with the first layer, wherein the interface of the second layer on the first layer forms a bulk heterojunction.